FIG.1

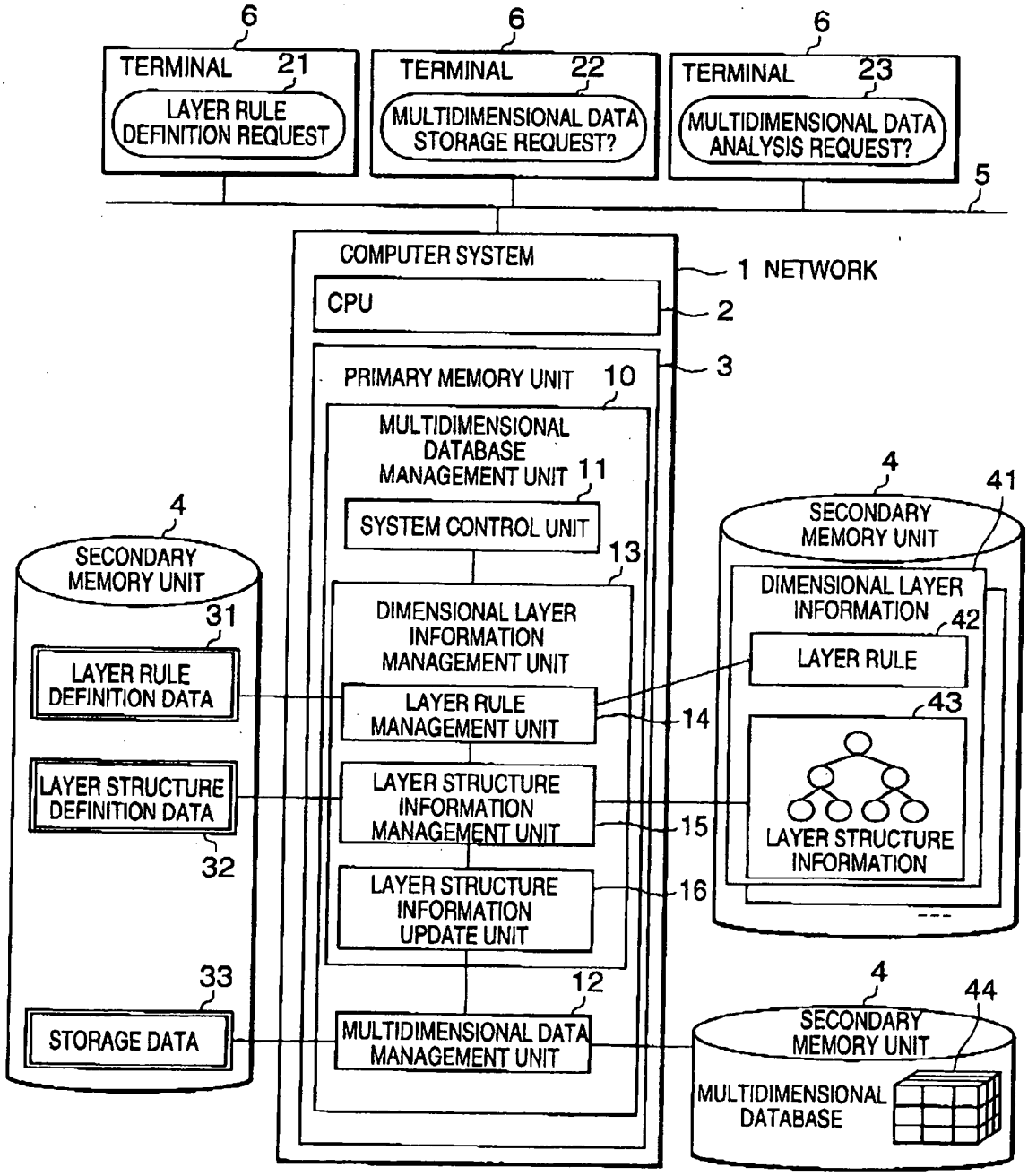

6
TERMINAL 21
LAYER RULE DEFINITION REQUEST
6
TERMINAL 22
MULTIDIMENSIONAL DATA STORAGE REQUEST?
6
TERMINAL 23
MULTIDIMENSIONAL DATA ANALYSIS REQUEST?
5
COMPUTER SYSTEM
1 NETWORK
CPU
2
PRIMARY MEMORY UNIT 10
3
MULTIDIMENSIONAL DATABASE MANAGEMENT UNIT 11
SYSTEM CONTROL UNIT
13
DIMENSIONAL LAYER INFORMATION MANAGEMENT UNIT
LAYER RULE MANAGEMENT UNIT
14
LAYER STRUCTURE INFORMATION MANAGEMENT UNIT
15
LAYER STRUCTURE INFORMATION UPDATE UNIT
16
12
MULTIDIMENSIONAL DATA MANAGEMENT UNIT
4
SECONDARY MEMORY UNIT
31
LAYER RULE DEFINITION DATA
LAYER STRUCTURE DEFINITION DATA
32
33
STORAGE DATA
4
41
SECONDARY MEMORY UNIT
DIMENSIONAL LAYER INFORMATION
42
LAYER RULE
43
LAYER STRUCTURE INFORMATION
4
44
SECONDARY MEMORY UNIT
MULTIDIMENSIONAL DATABASE

FIG.2

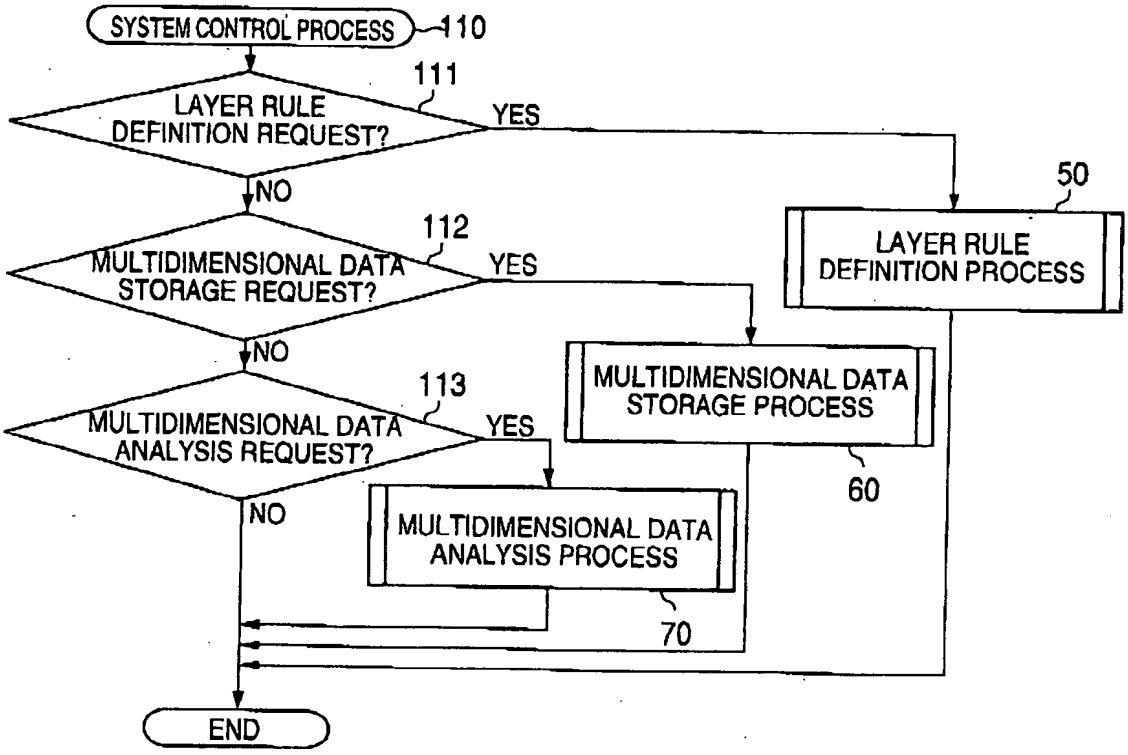

SYSTEM CONTROL PROCESS
110
111
LAYER RULE DEFINITION REQUEST?
YES
NO
50
LAYER RULE DEFINITION PROCESS
112
MULTIDIMENSIONAL DATA STORAGE REQUEST?
YES
NO
MULTIDIMENSIONAL DATA STORAGE PROCESS
60
113
MULTIDIMENSIONAL DATA ANALYSIS REQUEST?
YES
NO
MULTIDIMENSIONAL DATA ANALYSIS PROCESS
70
END

FIG.3

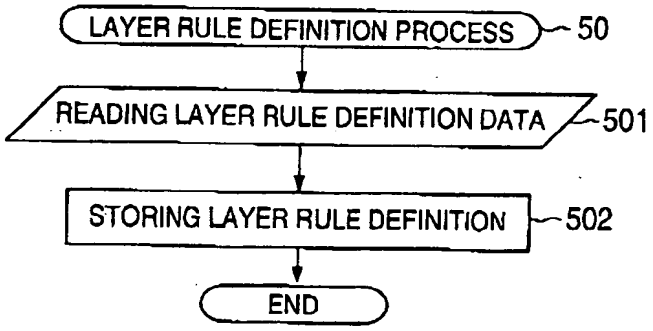

LAYER RULE DEFINITION PROCESS
50
READING LAYER RULE DEFINITION DATA
501
STORING LAYER RULE DEFINITION
502
END

FIG.4

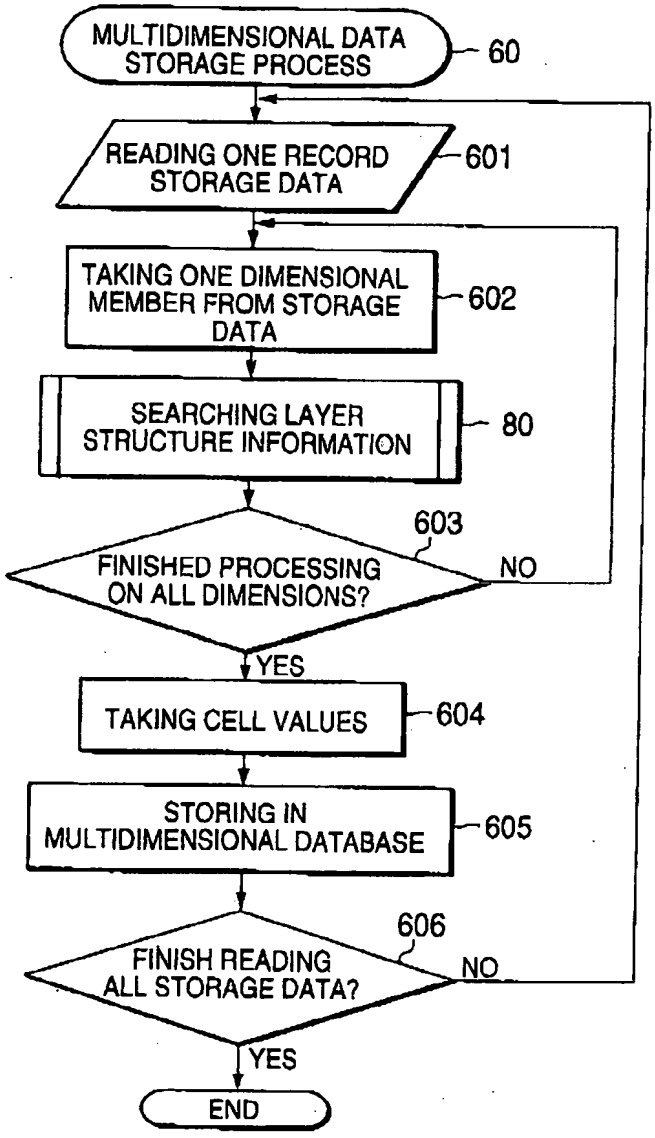

MULTIDIMENSIONAL DATA STORAGE PROCESS
60
READING ONE RECORD STORAGE DATA
601
TAKING ONE DIMENSIONAL MEMBER FROM STORAGE DATA
602
SEARCHING LAYER STRUCTURE INFORMATION
80
603
FINISHED PROCESSING ON ALL DIMENSIONS?
NO
YES
TAKING CELL VALUES
604
STORING IN MULTIDIMENSIONAL DATABASE
605
606
FINISH READING ALL STORAGE DATA?
NO
YES
END

FIG.5

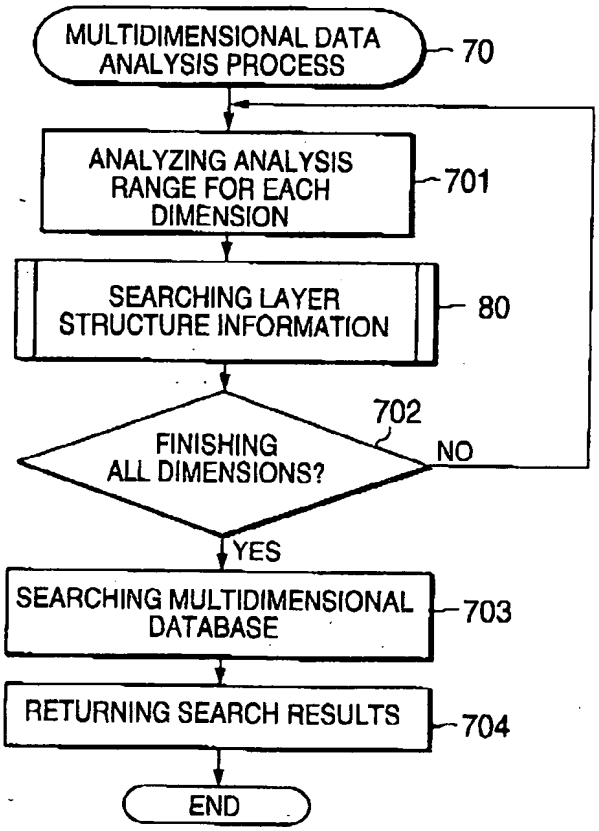

MULTIDIMENSIONAL DATA ANALYSIS PROCESS
70
ANALYZING ANALYSIS RANGE FOR EACH DIMENSION
701
SEARCHING LAYER STRUCTURE INFORMATION
80
FINISHING ALL DIMENSIONS?
702
NO
YES
SEARCHING MULTIDIMENSIONAL DATABASE
703
RETURNING SEARCH RESULTS
704
END

FIG.6

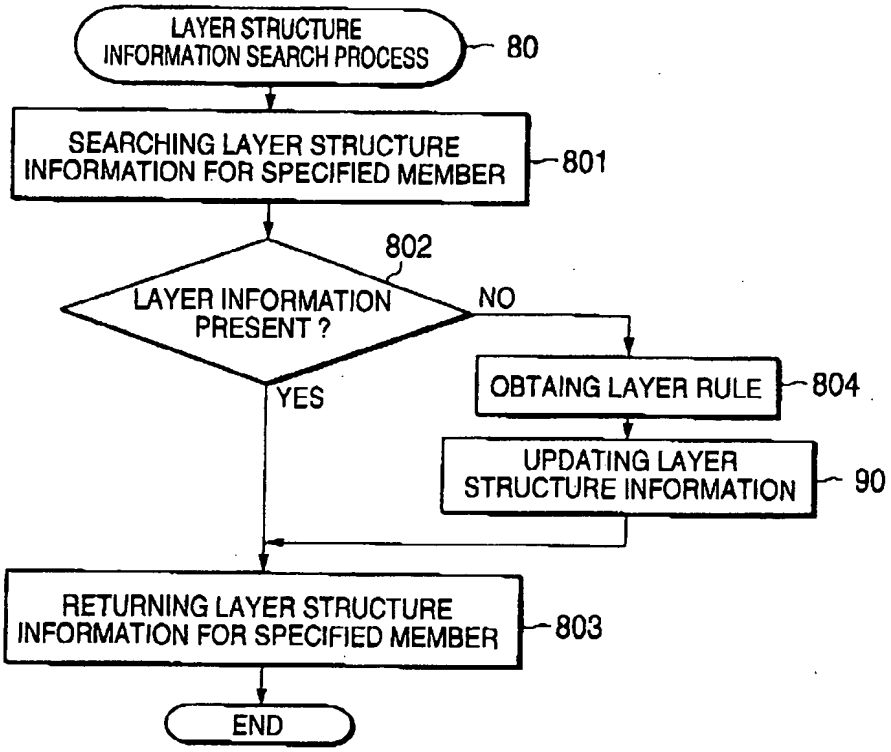

LAYER STRUCTURE INFORMATION SEARCH PROCESS
80
SEARCHING LAYER STRUCTURE INFORMATION FOR SPECIFIED MEMBER
801
802
LAYER INFORMATION PRESENT ?
NO
YES
OBTAING LAYER RULE
804
UPDATING LAYER STRUCTURE INFORMATION
90
RETURNING LAYER STRUCTURE INFORMATION FOR SPECIFIED MEMBER
803
END

FIG.7

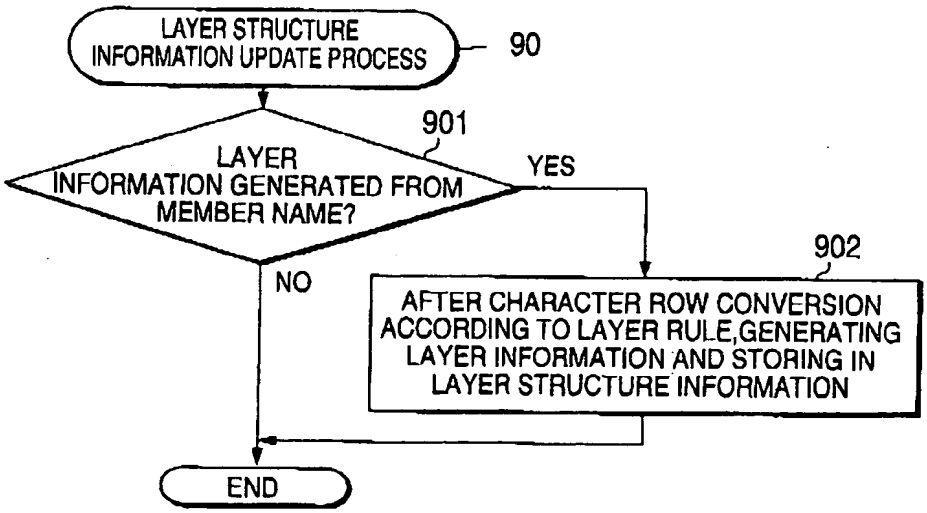

LAYER STRUCTURE INFORMATION UPDATE PROCESS
90
901
LAYER INFORMATION GENERATED FROM MEMBER NAME?
YES
NO
902
AFTER CHARACTER ROW CONVERSION ACCORDING TO LAYER RULE,GENERATING LAYER INFORMATION AND STORING IN LAYER STRUCTURE INFORMATION
END

FIG.8

TIME DIMENSIONAL LAYER RULE DEFINITION DATA 3110

```
#LAYER RULE :
#AFTER CHARACTER ROW CONVERSION ON MEMBER, OBTAINING LAYER INFORMATION

FROM MEMBER NAME
LEVEL10= $ MEMBER NAME
LEVEL11={
   S/¥(.... ¥)0[123]/¥1Q1/
   S/¥(.... ¥)0[456]/¥1Q2/
   S/¥(.... ¥)0[789]/¥1Q3/
   S/¥(.... ¥)1[012]/¥1Q4/
]
LEVEL12={
   S/¥(.... ¥)../¥1/
]
```

JP2001-350866

FIG.9

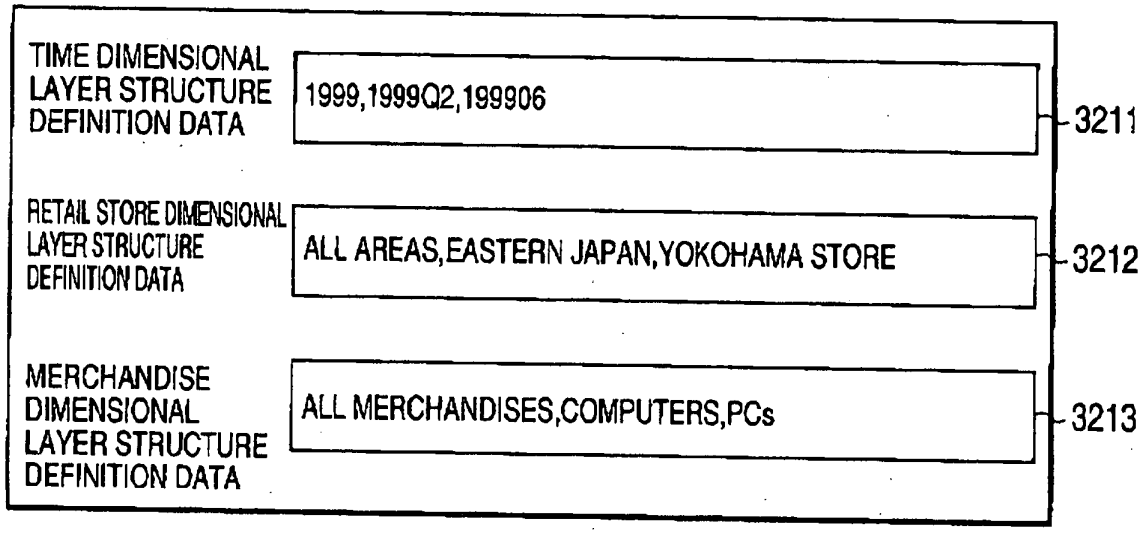


FIG.10

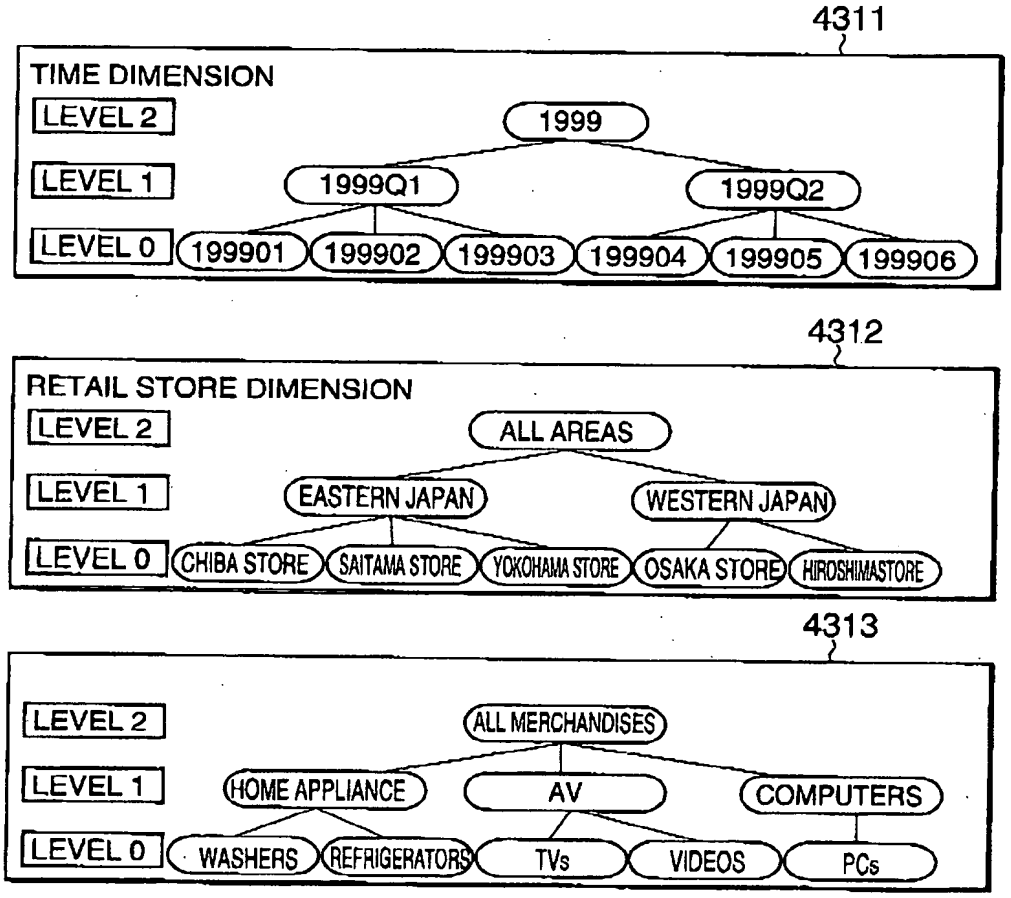

4311
TIME DIMENSION
LEVEL 2
LEVEL 1
LEVEL 0
1999
1999Q1
1999Q2
199901
199902
199903
199904
199905
199906
4312
RETAIL STORE DIMENSION
LEVEL 2
LEVEL 1
LEVEL 0
ALL AREAS
EASTERN JAPAN
WESTERN JAPAN
CHIBA STORE
SAITAMA STORE
YOKOHAMA STORE
OSAKA STORE
HIROSHIMASTORE
4313
LEVEL 2
LEVEL 1
LEVEL 0
ALL MERCHANDISES
HOME APPLIANCE
AV
COMPUTERS
WASHERS
REFRIGERATORS
TVs
VIDEOS
PCs

FIG.11

RETAIL STORE DIMENSIONAL LAYER RULE DEFINITION DATA 3120

```
#LAYER RULE :
#OBTAINING LAYER INFORMATION FROM CSV FORMATTED FILE

FROM FILE,CSV FILE
LEVEL0=COLUMN 3
LEVEL1=COLUMN 2
LEVEL2=COLUMN 1
```

FIG.12

3126

```
ALL AREAS,EASTERN JAPAN,CHIBA STORE
ALL AREAS,EASTERN JAPAN,SAITAMA STORE
ALL AREAS,EASTERN JAPAN,YOKOHAMA STORE
ALL AREAS,WESTERN JAPAN,OSAKA STORE
ALL AREAS,WESTERN JAPAN,HIROSHIMA STORE
```

FIG.13

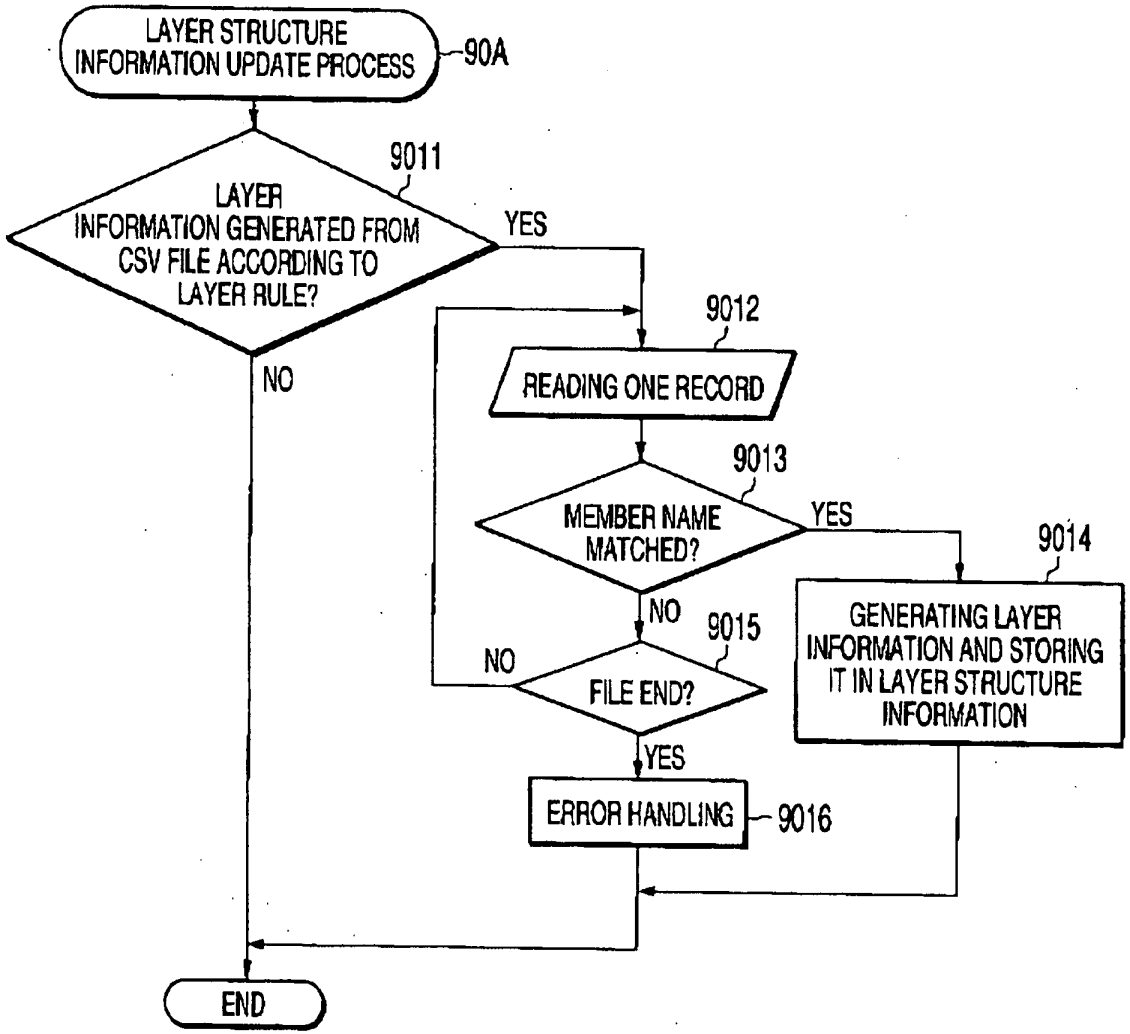

LAYER STRUCTURE INFORMATION UPDATE PROCESS
90A
9011
LAYER INFORMATION GENERATED FROM CSV FILE ACCORDING TO LAYER RULE?
YES
NO
9012
READING ONE RECORD
9013
MEMBER NAME MATCHED?
YES
NO
9014
GENERATING LAYER INFORMATION AND STORING IT IN LAYER STRUCTURE INFORMATION
9015
FILE END?
NO
YES
ERROR HANDLING
9016
END

FIG.14

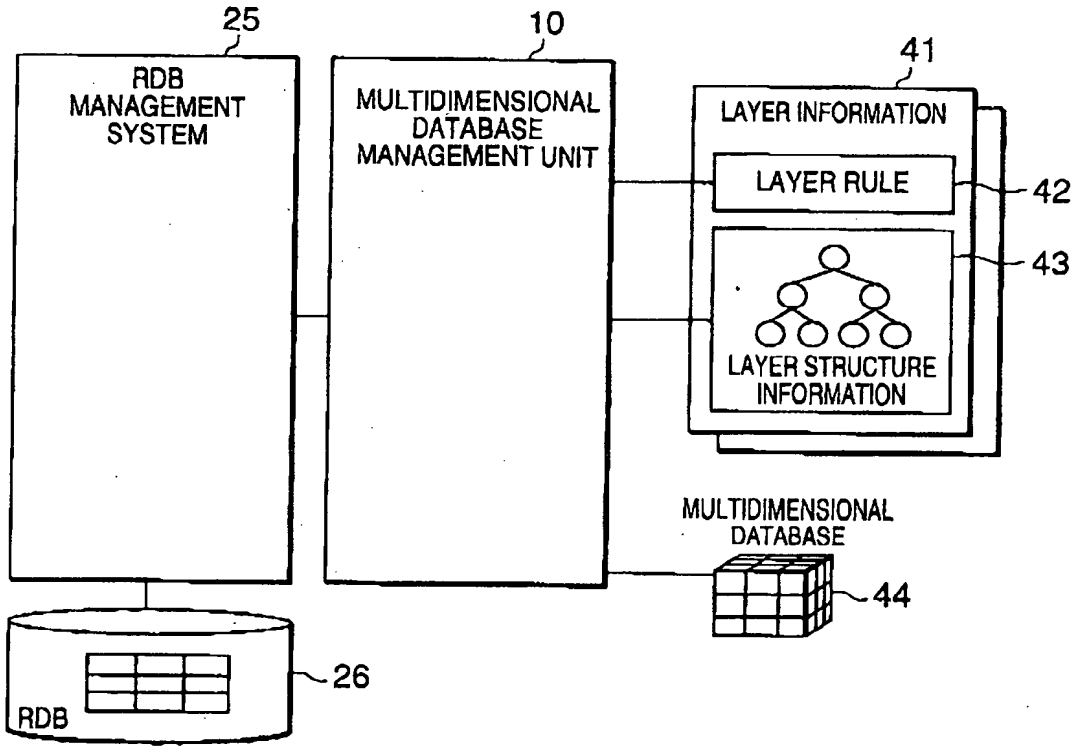

25
RDB MANAGEMENT SYSTEM
10
MULTIDIMENSIONAL DATABASE MANAGEMENT UNIT
41
LAYER INFORMATION
LAYER RULE
42
43
LAYER STRUCTURE INFORMATION
MULTIDIMENSIONAL DATABASE
44
RDB
26

FIG.15

MERCHANDISE DIMENSIONAL LAYER RULE DEFINITION DATA 3130

```
#LAYER RULE : RDB PRODUCT MASTER LIST
#OBTAINING FROM COL1,COL2
FROM RDB PRODUCT MASTER LIST
LEVEL 0=SMALL CLASSIFICATION
LEVEL 1=LARGE CLASSIFICATION
LEVEL 2="ALL MERCHANDISE"
```

FIG.16

CONTENT OF RDB PRODUCT MASTER TABLE

LARGE CLASSIFICATION	SMALL CLASSIFICATION
HOME APPLIANCE	WASHERS
HOME APPLIANCE	REFRIGERATORS
AV	TVs
AV	VIDEOS
COMPUTERS	PCs

261

FIG.17

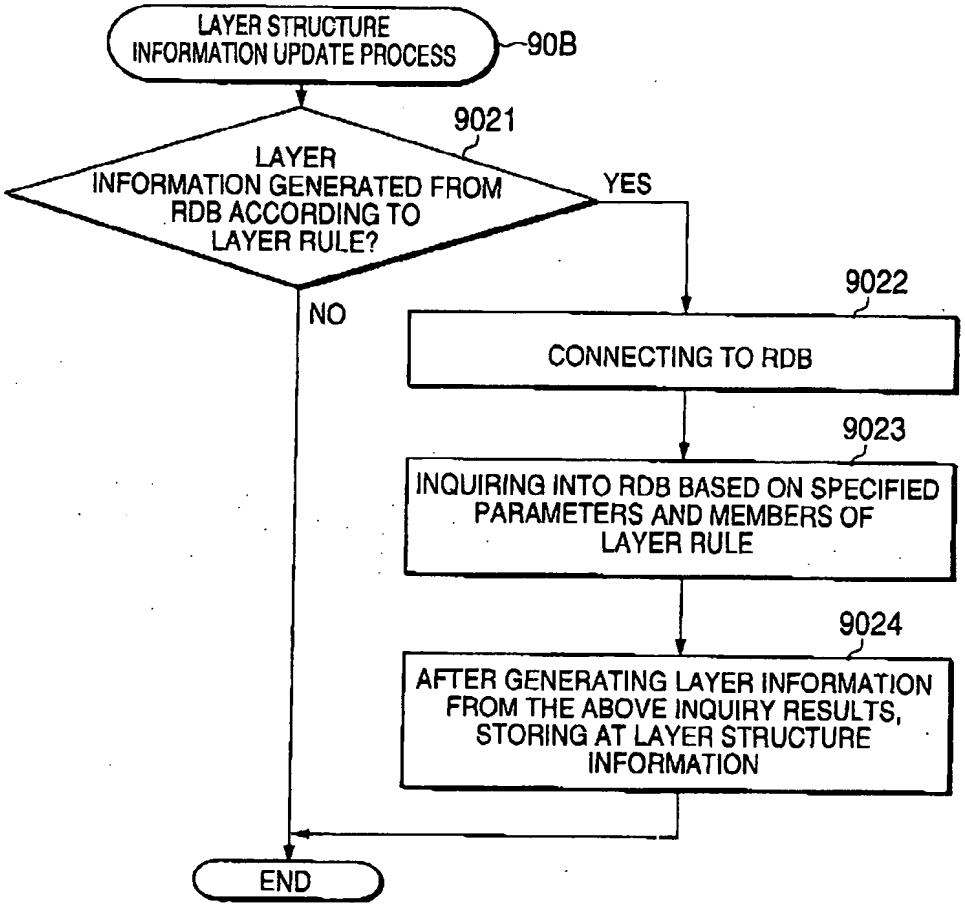

LAYER STRUCTURE INFORMATION UPDATE PROCESS
90B
9021
LAYER INFORMATION GENERATED FROM RDB ACCORDING TO LAYER RULE?
YES
NO
9022
CONNECTING TO RDB
9023
INQUIRING INTO RDB BASED ON SPECIFIED PARAMETERS AND MEMBERS OF LAYER RULE
9024
AFTER GENERATING LAYER INFORMATION FROM THE ABOVE INQUIRY RESULTS, STORING AT LAYER STRUCTURE INFORMATION
END

FIG.18

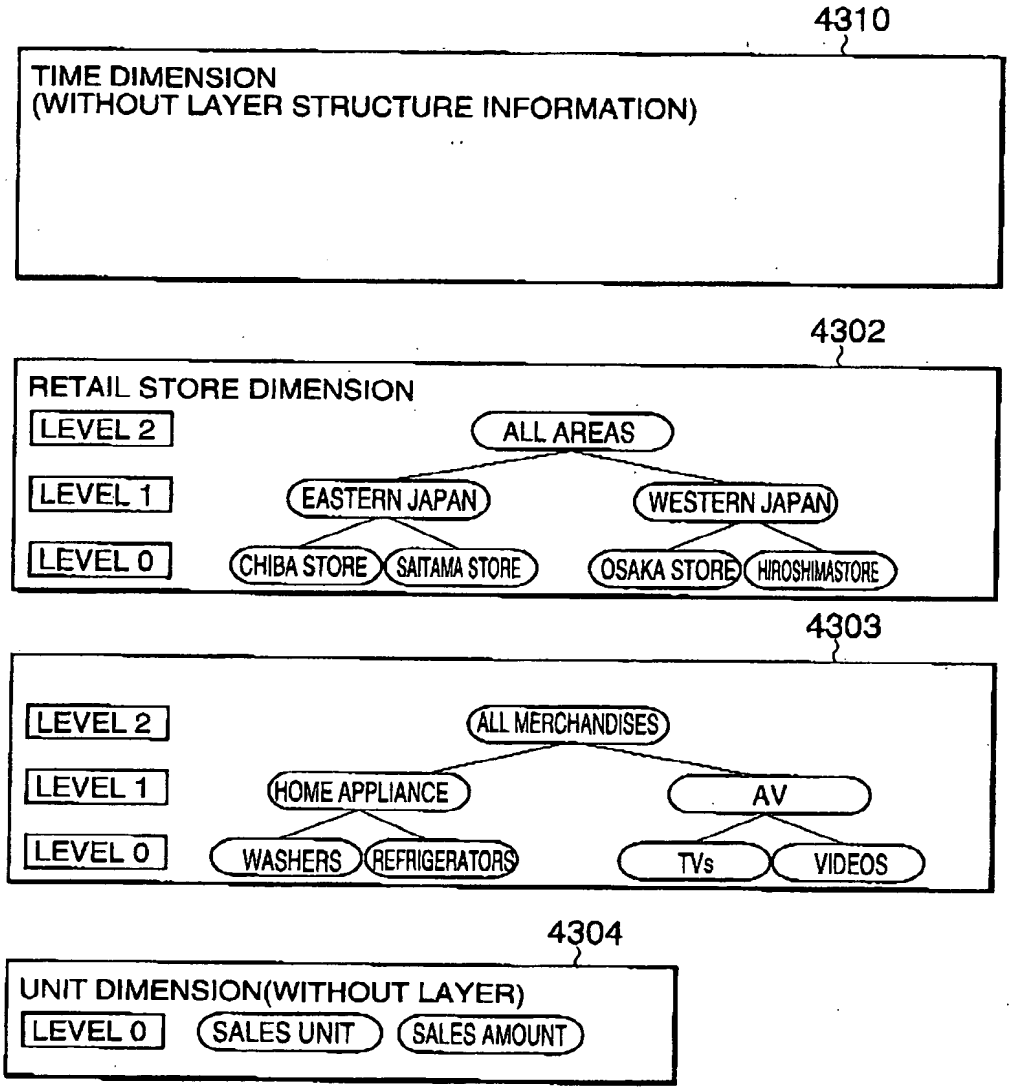

4310
TIME DIMENSION
(WITHOUT LAYER STRUCTURE INFORMATION)
4302
RETAIL STORE DIMENSION
LEVEL 2
LEVEL 1
LEVEL 0
ALL AREAS
EASTERN JAPAN
WESTERN JAPAN
CHIBA STORE
SAITAMA STORE
OSAKA STORE
HIROSHIMASTORE
4303
LEVEL 2
LEVEL 1
LEVEL 0
ALL MERCHANDISES
HOME APPLIANCE
AV
WASHERS
REFRIGERATORS
TVs
VIDEOS
4304
UNIT DIMENSION(WITHOUT LAYER)
LEVEL 0
SALES UNIT
SALES AMOUNT

FIG.19

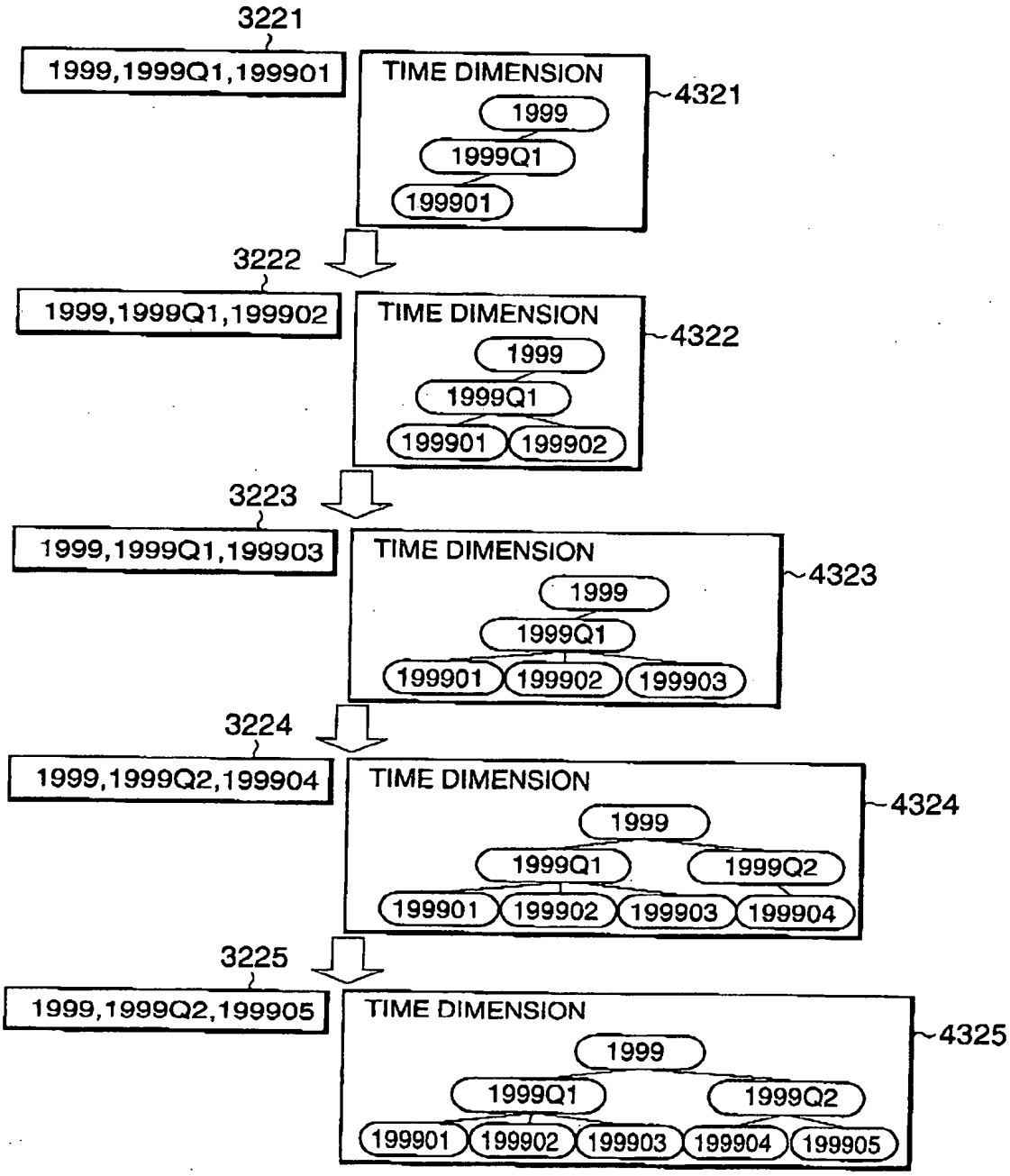

3221
1999,1999Q1,199901
TIME DIMENSION
1999
1999Q1
199901
4321
3222
1999,1999Q1,199902
TIME DIMENSION
1999
1999Q1
199901
199902
4322
3223
1999,1999Q1,199903
TIME DIMENSION
1999
1999Q1
199901
199902
199903
4323
3224
1999,1999Q2,199904
TIME DIMENSION
1999
1999Q1
1999Q2
199901
199902
199903
199904
4324
3225
1999,1999Q2,199905
TIME DIMENSION
1999
1999Q1
1999Q2
199901
199902
199903
199904
199905
4325

FIG.20 PRIOR ART

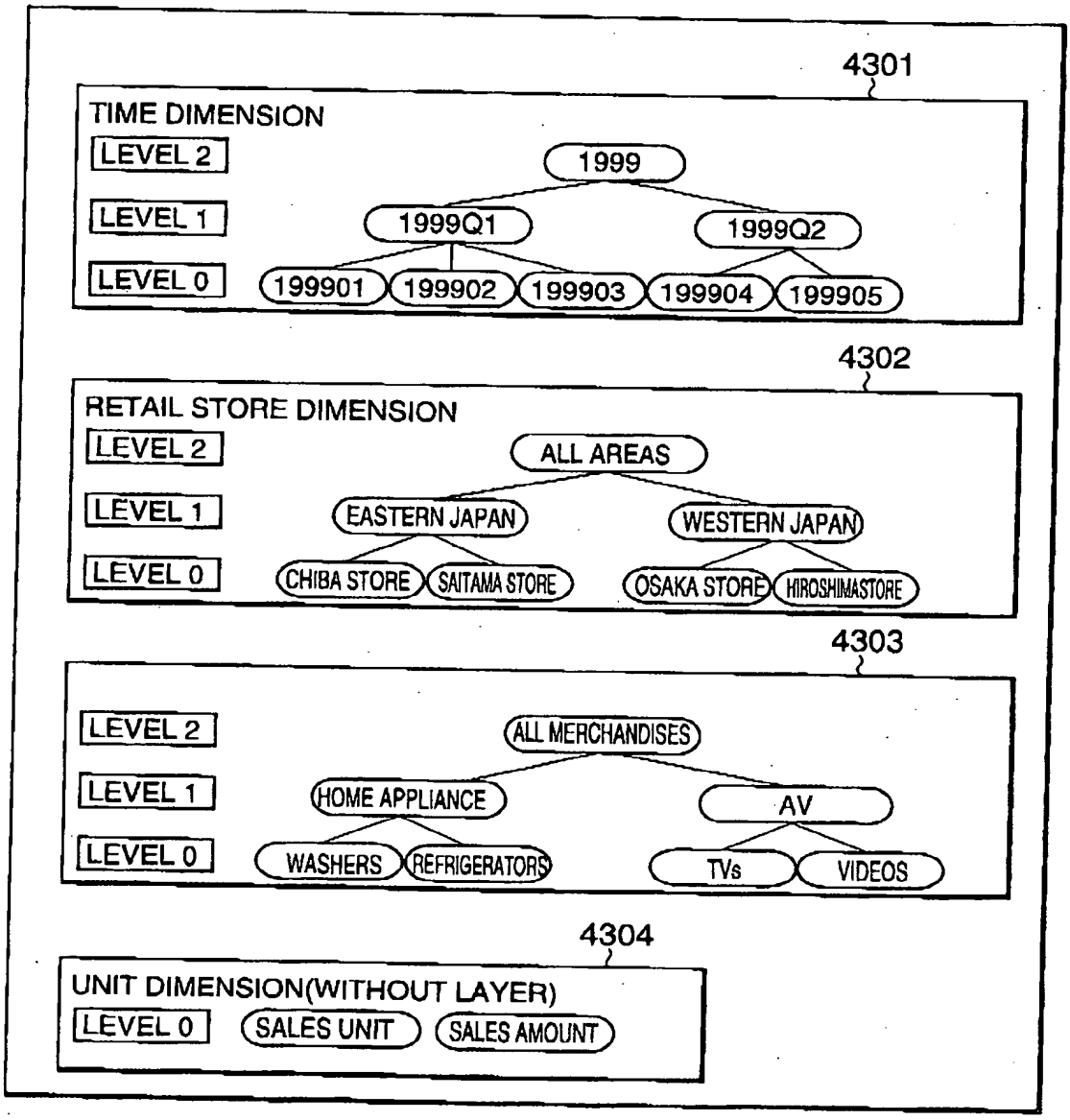


FIG.21 PRIOR ART

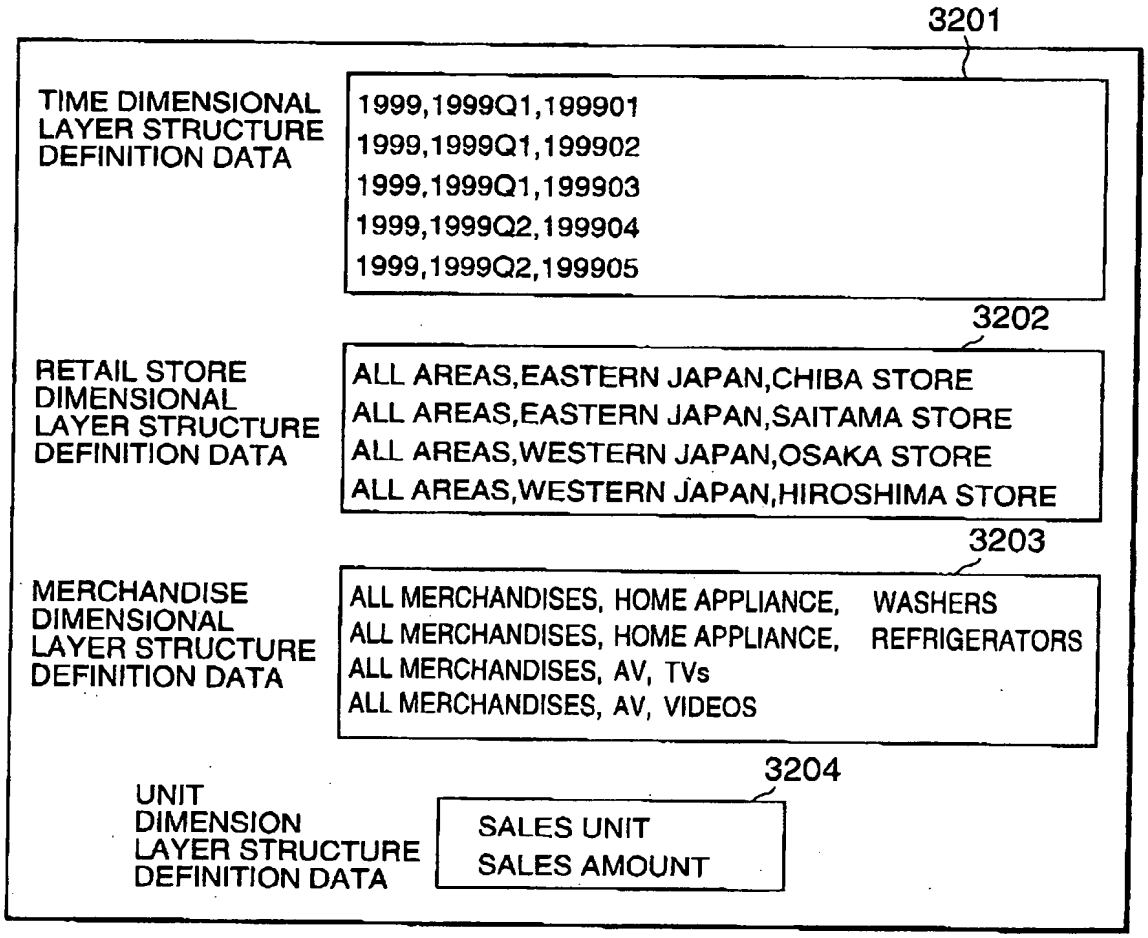


FIG.22 PRIOR ART

3301

199901,	SAITAMA STORE,	TVs,	22, 2420000
199901,	OSAKA STORE,	REFRIGERATORS,	15, 1350000
199902,	HIROSHIMA STORE,	VIDEOS,	42, 2940000
199902,	SAITAMA STORE,	WASHERS,	21, 1680000
199903,	CHIBA STORE,	VIDEOS,	33, 2310000
199904,	HIROSHIMA STORE,	REFRIGERATORS,	18, 1620000
199905,	CHIBA STORE,	TVs,	45, 4950000
	⋮		

FIG.23 PRIOR ART

MERCHANDISE DIMENSION	TVS
UNIT DIMENSION	SALES AMOUNT

TIME DIMENSION / RETAIL STORE DIMENSION	199901	199902	199903	19999Q1	199904	199905	19999Q2	1999
CHIBA STORE	1100000	330000	770000	2200000	1100000	660000	1760000	3960000
SAITAMA STORE	990000	990000	660000	2640000	660000	990000	1650000	4290000
EASTERN JAPAN	2090000	1320000	1430000	4840000	1760000	1650000	3410000	8250000
OSAKA STORE	1100000	1100000	1100000	3300000	110000	990000	1100000	4400000
HIROSHIMA STORE	330000	550000	1100000	1980000	1100000	660000	1760000	3740000
WESTERN JAPAN	1430000	1650000	2200000	5280000	1210000	1650000	2880000	8140000
ALL AREAS	3520000	2970000	3630000	10120000	2970000	3300000	6270000	16390000

FIG.24 PRIOR ART

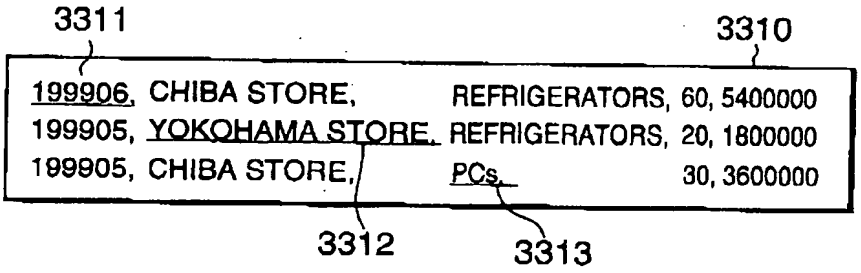


FIG.25 PRIOR ART

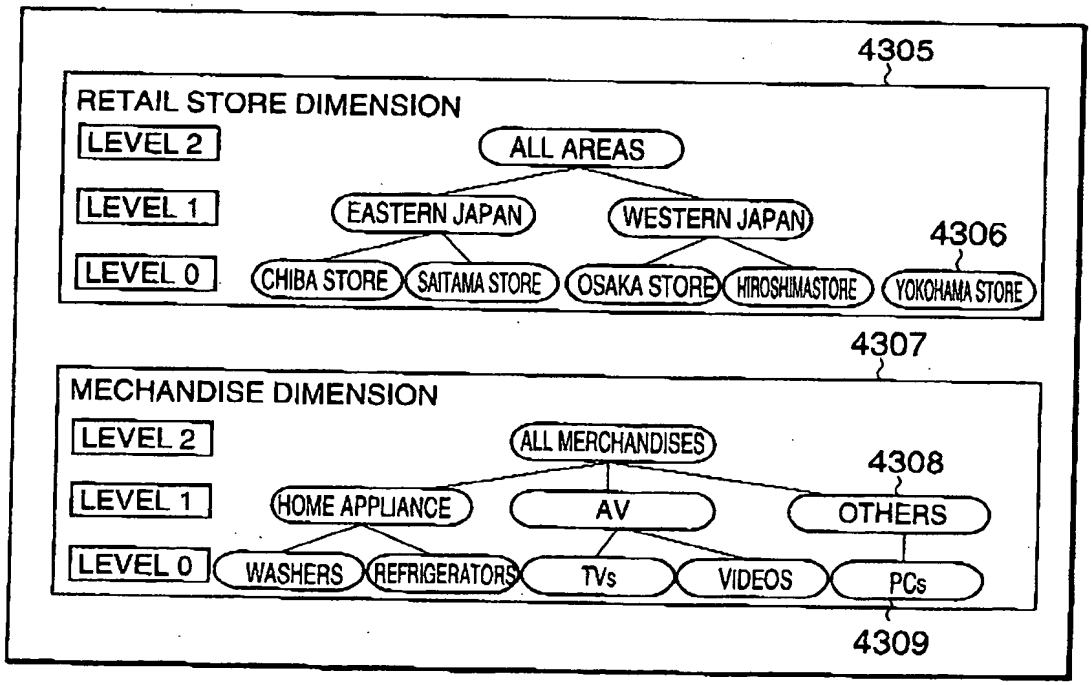


FIG.26

RETAIL STORE DIMENSION LAYER DEFINITION DATA

```
#MAIN LAYER RULE:
#SEQUENTIALLY APPLYING SUBRULES
APPLYING SUBRULE STORE_RULE1
APPLYING SUBRULE STORE_RULE2
```

3140

```
#SUB LAYER RULE :STORE_RULE1
#FROM CSV FILE,OBTAINING LAYER INFORMATION
FROM FILE,CSV FILE1
LEVEL 0=COLUMN 3
LEVEL 1=COLUMN 2
LEVEL 2=COLUMN 1
```

3141

```
#SUB LAYER RULE:STORE_RULE 2:
#AFTER CHARACTER ROW CONVERSION ON RETAIL STORE, OBTAINING LAYER INFORMATION
FROM MEMBER NAME
LEVEL 0= $ MEMBER NAME
LEVEL1={
   S/¥(.JAPAN¥). $ /¥1/
}
LEVEL 2={
    ALL SALES TERRITORIES
}
```

3142

FIG.27

3340

```
199901,  EASTERN JAPAN  SAPPORO STORE, TVS,17, 1870000
199902,  HIROSHIMA STORE, VIDEOS, 42, 2940000
199903,  EASTERN JAPAN  SAPPORO STORE, REFRIGERATOR,15,1350000
```

FIG.28

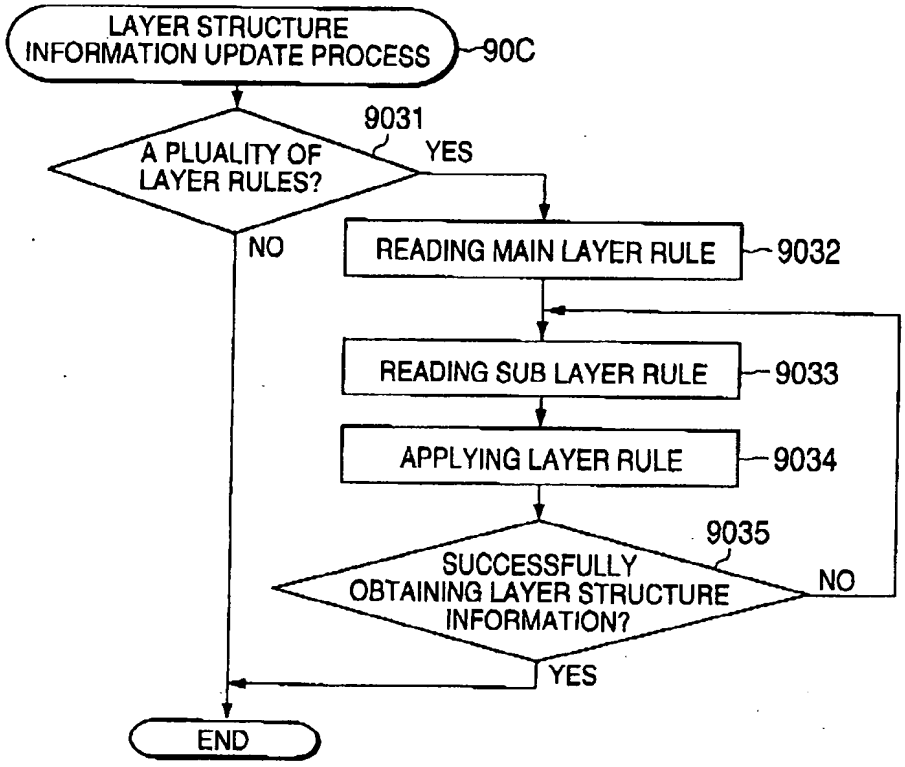
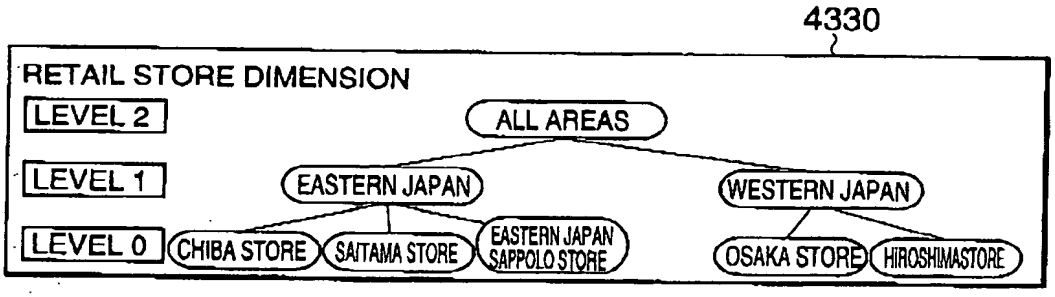

LAYER STRUCTURE INFORMATION UPDATE PROCESS
90C
9031
A PLUALITY OF LAYER RULES?
YES
NO
READING MAIN LAYER RULE
9032
READING SUB LAYER RULE
9033
APPLYING LAYER RULE
9034
9035
SUCCESSFULLY OBTAINING LAYER STRUCTURE INFORMATION?
NO
YES
END

FIG.29


4330
RETAIL STORE DIMENSION
LEVEL 2
ALL AREAS
LEVEL 1
EASTERN JAPAN
WESTERN JAPAN
LEVEL 0
CHIBA STORE
SAITAMA STORE
EASTERN JAPAN SAPPOLO STORE
OSAKA STORE
HIROSHIMASTORE